HITACHI

Model V-050B

Oscilloscope

SERVICE MANUAL

Hitachi Denshi, Ltd.

WARRANTY

This Hitachi Denshi, Ltd. product is warranted against defects in materials and workmanship for a period of one year from the date of shipment, except for batteries, fuse and probe. Hitachi Denshi, Ltd. will, at its option, repair or replace products which prove to be defective during the warranty period provided they are returned to HITACHI DENSHI AMERICA, LTD. prepaid. Repairs necessitated by misuse of the product are not covered by this warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED. Hitachi Denshi, Ltd. IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

WARNING

Dangerous potentials exist at several points through-out this instrument. When the instrument is operated with the cover removed, do not touch exposed connections or components.

Disconnect power cord of the instrument from power source before removing covers.

Use an insulated screwdriver for adjustment.

NOTE

This instrument should be adjusted at an ambient temperature of +20°C($\pm$5°C) for best overall accuracy.

Allow at least 20 minutes warmup before proceeding.

TABLE OF CONTENTS

1. General 1

1.1 Introduction 1

1.2 Composition 2

1.3 Specifications 2

2. CALIBRATION 8

POWER SUPPLY AND DISPLAY 8

VERTICAL SYSTEM 11

TRIGGER SYSTEM 16

HORIZONTAL SYSTEM 21

CALIBRATOR 23

OTHER SYSTEM 24

3. ELECTRICAL REPLACEABLE PARTS LIST AND CIRCUIT BOARD ILLUSTRATIONS 26

4. DIAGRAMS 35

5. MECHANICAL REPLACEABLE PARTS LIST 40

1. General

1.1 Introduction

HITACHI V-059B oscilloscope is a handy video oscilloscope with a frequency range of DC to 7 MHz, having various oscilloscope functions and video functions for universal applications. This oscilloscope can be used widely as a TV waveform monitor and for the maintenance and adjustment of various image-displaying instruments such as VTR, CCTV, TV cameras, TV studio equipment, and video-applied systems.

The vertical axis has DC restorer function, whose maximum sensitivity is 10 mv/DIV. Therefore, video signal waveform can be displayed stably on the screen. In addition, a 1 MΩ input and 75 Ω input can be selected freely by one touch.

The sync. circuit incorporates an exclusive sync. separator circuit in addition to the general synchronizing circuit used in universal type oscilloscope. This enable the system to obtain a stable TV synchronization. The vertical sync. and horizontal sync. can be automatically changed over, according to the sweep range.

The horizontal axis has sweep ranges of 2 V and 2H in addition to the time base range, being able to be driven by an external sweeper.

Reading can be made directly in the unit of IRE by means of external graticule. Battery can also be used as a power supply, which can be switched freely to AC according to the application.

1.2 Composition

1.	V-059B oscilloscope	1
2.	AD-058B battery pack	1
3.	External graticule (attached to oscilloscope)	1
4.	AT-10P1.5 probe	1
	Probe housing	1
	Pincher tip	1
	Needle tip attachment	1
	Alligator attachment	1
	Ground lead	1
5.	Protective cover	1
6.	Viewing hood	1
7.	Screw driver for adjustment	1
8.	Operation manual	1

1.3 Specifications

1.3.1 V-059B

° VERTICAL DEFLECTION:

Bandwidth and Risetime; 0°C to + 40°C

DC to at least 7 MHz, 50 ns or less

DC to at least 2 MHz, 175 ns or less using x5 gain

Input Coupling

AC, DC or 75 ohm selectable. Using a high impedance 10x probe, 75 ohm position will be an apparent ground. For AC coupling, the low frequency - 3dB point is 10Hz or less; 1 Hz or less with a 10x probe.

Deflection Factor

50mV/div to 2 V/div in 6 calibrated steps

(1-2-5 sequence), 10mV/div and 20mV/div using x5 gain, accurate within 3% from +20°C to +30°C and 5% from 0°C to +40°C. Continuously variable between steps and to at least 5 V/div

Input R and C

AC and DC: 1M ohm ± 2%, approx. 40pF

75 ohm: 75 ohm ± 2%

DC Restorer

Slow acting sync tip DC restoration. Sync tip level shift due to changes in APL from 10 to 90% will not exceed 3 IRE units. May be disabled when desired by front panel switch.

Maximum Input Voltage

AC, DC and Ground: 100V (DC + peak AC), 100Vp-p AC at 1 KHz or less.

75 ohm: 5V rms max.

300V (DC + peak AC), 300 Vp-p AC at 1 KHz or less with a 10X probe.

° HORIZONTAL DEFLECTION:

Time Base

10 µs/div to 20 ms/div in 6 calibrated steps (1-5-20 sequence).

x10 MAG extends fastest sweep rate to 1 µs/div

Continuously variable between steps and to at least 0.1 s/div

Time base may be selected 2V/10 div or 2H/10 div when horizontal display switch is in 2V-2H position.

Time Base Accuracy

	+20°C to +30°C	0°C to 40°C
×1	3%	5%
×10	5%	7%

External Horizontal Input

DC to at least 10 KHz. Approx. 2V/div and 0.2V/div with a ×10 MAG. Input R: approx 20K ohms. Maximum Input Voltage: 100V (DC + Peak AC), 100 Vp-p AC at 1 KHz or less.

TRIGGERING:

Trigger Modes

Automatic (sweep free-runs in the absence of a trigger and for signals below 100 Hz)
Normal (sweep runs when triggered).

Coupling

AC

TV Sync Separator

An internal TV Sync Separator circuit permits stable internal Line or Field-rate triggering from displayed composite video or composite sync waveforms.

Trigger Source

Internal, External, and Line

Level and Slope

For Internal Trigger, permits triggering at any point on the positive or negative slope of the displayed waveform.

For External Trigger, permits triggering on any level between -2V to +2V.

Trigger Sensitivity

	Internal	External
50 Hz to 1 MHz	1 div deflection	400 mV
At 7 MHz	2 div deflection	800 mV

TV sync pulse amplitude requirements - 1 div deflection for internal and 400 mV for external in TV (-) slope selection.

External Trigger Input

Approx. 1 M ohm; Approx. 40 ρF 100V (DC + peak AC), 100Vρ-ρ AC at 1 KHz or less.

CRT

8 × 10 div display area, each div is 6,35mm. Rectangular tube, P31 Phosphor 1.5 KV accelerating potential.

Graticule

Internal, nonparallax, nonilluminated.
External - 40 0 100 IRE Unit graticule on light filter.

ENVIRONMENTAL CAPABILITIES

Ambient Temperature

Operating : 0°C to +40°C
Storage : -20°C to +70°C

OTHER CHARACTERISTICS:

Amplitude Calibrator

Sweep gate output, 1V ± 2% (+15°C to +35°C)

positive - going rectangular pulse.

Power Requirements

117V ± 10%. 50Hz to 400Hz. Approx. 18W at 117V, 60Hz. External DC source of 11.5V to 14 V, requires approx. 0.8A.

Operates from an AD-058B Battery Pack.

Dimensions:

Height	85mm	3.35"
Width	198mm	7.8"
Depth	292mm	11.5"
Depth (with handle extended)	360mm	18.17"

Weight

Net	2.9Kg	6.4 lbs.

AD-058B BATTERY PACK

The model AD-058B provides up to 3 hours of operation for the model V-059B. The pack may be attached on the bottom of the above oscilloscope.

SPECIFICATIONS:

Output Power	12V, 2.7 Ah from full charge (sealed lead-acid gel)
Charging Source	V-059B oscilloscope with power cord connected to AC line; the scope's operation is stopped in charging mode

Charging Time	15 hours, charging current is automatically set to trickle level at full charge.
Ambient Temperature:	Operating o°C~+40°C
	Charging "
	Storage "
Dimensions	Height 42mm 1.65"
	Width 162mm 6.38"
	Depth 262mm 10.3"
Weight	1.7 kg (net) 3.74 lbs.

2. CALIBRATION

POWER SUPPLY AND DISPLAY CALIBRATION

Note 1

Vertical Controls

V/DIV	0.2
VARIABLE	CAL
Vertical POSITION	Midrange
×5 VERT GAIN	Pushed in
V-IN (side panel)	75 Ω

Trigger Controls

LEVEL	Midrange (pulled out)
SOURCE (side panel)	INT
SLOPE (side panel)	+
DC REST	OFF

Power Controls

POWER (TOP cover)	ON
POWER MODE (rear panel)	AC

Horizontal Controls

TIME (ms)/DIV	1
Horizontal POSITION	Midrange
×10 HORIZ MAG	Pushed in
VARIABLE (TOP cover)	CAL.

Horizontal Display Controls

H.DISP (side panel)	2V·2H

CRT Controls

FOCUS (TOP cover)	Midrange
INTEN (TOP cover)	Midrange

1. Adjust +10 Volt Power Supply

   a. Connect the DC voltmeter between test point of B 20 and B 21.

   b. CHECK - Meter reading: +10 volts, ±0.05 volt.

   c. ADJUST - +10 volts adjustment, RV1112 for +10.0 volts, ±0.03 volt.

   d. Connect the DC voltmeter between the test point B 21 and chassis ground.

   e. CHECK - Meter reading; 0 ± 0.05 volt.

2. Adjust +12 Volt Power Supply

   a. Connect the DC voltmeter between Q1130 emitter and chassis ground.

   b. CHECK - Meter reading; +12 volts, ±0.05 volt.

   c. ADJUST - +12 volts adjustment, RV1130 for +12.00 volts, ±0.03 volt.

3. Adjust -12 Volt Power Supply

   a. Connect the DC voltmeter between Q1131 emitter and chassis ground.

   b. CHECK - Meter reading -12 volts, ±0.05 volt

   c. ADJUST - -12 volts adjustment, RV1131 for -12.00 volts, ±0.03 volt.

4. Adjust Trace Rotation

   a. Position the trace to the center horizontal line with the vertical POSITION control.

   b. CHECK - That the trace is parallel with the center horizontal line.

   c. ADJUST - TRACE ROTATION adjustment, RV1050, so the trace is parallel to the center horizontal line.

5. Adjust Astigmatism

   a. Change the following control settings; V-IN DC

   b. Set the INTENSITY control midway between a barely visible trace and fully clockwise.

   c. Connect the sine wave generator to the V-IN connector with a 50-ohm BNC cable.

d. Set the sine wave generator for 500 Hz.

e. If necessary, set the TRIGGER control for a stable display.

f. CHECK - The peaks of the sine waves should be well defined within the areas indicated in Fig.1 with optimum setting of Focus control.

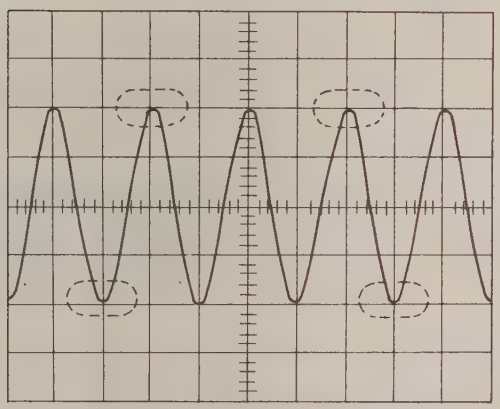


Fig. 1

g. ADJUST - Focus control and Astig adjustment, RV1030, for the best definition of the peaks of the sine waves within the areas indicated in Fig. 1.

VERTICAL SYSTEM CALIBRATION

Note 2

Vertical Controls

V/DIV	0.2
VARIABLE	CAL
Vertical POSITION	Midrange
×5 VERT GAIN	Pushed in
V-IN (side panel)	75 Ω

Trigger Controls

LEVEL	Midrange (Pulled out)
SOURCE (side panel)	INT
SLOPE (side panel)	+
DC REST	OFF

Power Controls

POWER (top cover)	ON
POWER MODE (rear panel)	AC

Horizontal Controls

TIME(ms)/DIV	1
Horizontal POSITION	Midrange
×10 HORIZ MAG	Pushed in
VARIABLE (top cover)	CAL

Horizontal Display Controls

H.DISP (side panel)	INT

CRT Controls

FOCUS (top cover)	Midrange
INTEN (top cover)	Midrange

6. Adjust Volts/Division Balance (STEP ATT BAL)

   a. Position the trace to the center horizontal line with the vertical POSITION control.

   b. CHECK - Change the V/DIV switch from 0.2 volt to 0.5 volt. Trace should not move more than 0.1 division.

   c. Adjust RV35 for minimum trace shift when rotation the V/DIV switch from 0.2 volt to 0.5 volt. If necessary, rotate the vertical position control to keep the trace in the center of the screen.

7. Adjust Vertical × 5 Balance (MAG CENT)

   a. Position the trace to the center horizontal line with the vertical POSITION control.

   b. Pull the × 5 VERT GAIN switch out. (Do not rotate)

   c. CHECK - Trace shift should be less than 0.5 division vertically.

   d. ADJUST - MAG CENT adjustment, RV51, to return the trace to the center horizontal line.

   e. Recheck step 6. If readjustment is necessary, recheck this step also.

8. Adjust Vertical × 1 Gain

   a. Change the following control settings:
      V-IN; DC

   b. Connect the standard amplitude calibrator output connector to the V-IN connector with a 50-ohm BNC cable.

   c. Set the standard amplitude calibrator for a 0.2 volt square-wave output.

   d. Center the display about the center horizontal line with the vertical POSITION control.

   e. CHECK - CRT display for four divisions of deflection.

   f. ADJUST - VERT × 1 GAIN adjustment, RV55, for exactly four divisions of deflection.

9. Adjust Vertical × 5 Gain

   a. Set the standard amplitude calibrator for a 50 milli-volt square-wave output.

   b. Pull the ×5 VERT GAIN switch out.

c. Center the display about the center horizontal line with the vertical POSITION control.

d. CHECK - CRT display for five divisions of deflection.

e. ADJUST - VERT × 5 GAIN adjustment,RV54, for exactly five divisions of deflection.

10. Adjust Input Capacitance

a. Change the following control settings:

V/DIV 0.05

b. Connect the capacity meter to the V-IN.

c. CHECK - Set the Input Capacitance within 40 pF ± 3pF.

d. ADJUST - Adjust CV11 to set the Capacitance of V-IN within 40pF ± 3pF.

11. Adjust Volts/Division Compensation

a. Change the following control settings:

V/DIV 0.5

b. Connect the square-wave generator output connector to the V-IN connector with a BNC cable.

c. Set the square-wave generator for a five-division display at one kilohertz.

d. Center the display about the center horizontal line with the vertical POSITION control.

e. CHECK - CRT display must be similar to Fig. 2(B).

f. ADJUST - Adjust the CV 13 to make the CRT display similar to Fig. 2 (B).

g. Change the following control settings;

V/DIV 0.05

h. Connect the AT-10P1.5 type Probe to the VERT INPUT.

i. Connect the probe tip to square-wave generator output connector.

j. Set the square-wave generator for a five-division display at one kilohertz.

k. Adjust the trimmer capacitor in the Probe to obtain the CRT display similar to Fig. 2 (B).

l. Change the following control settings;

V/DIV 0.5

m. Set the square-wave generator for a five-division display at one kilohertz.

n. CRT display must be similar to Fig. 2(B).

o. ADJUST - Adjust CV12 to obtain the CRT display similar to Fig. 2(B).

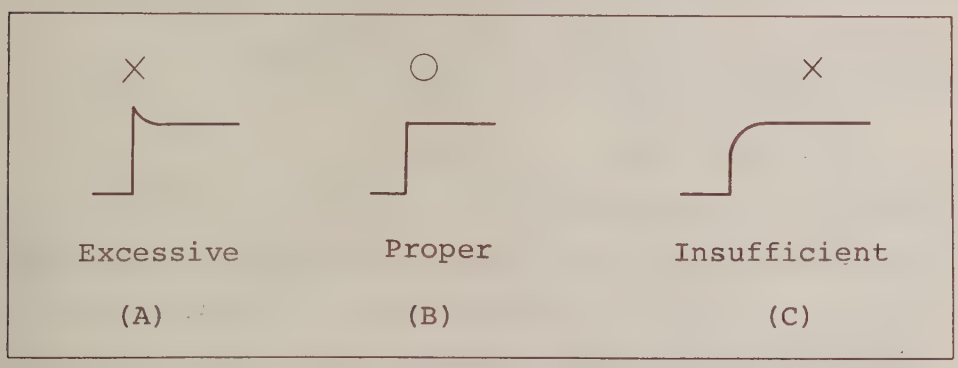


Fig. 2

12. Check High-Frequency Compensation

a. Change the following control settings;

×5 VERT GAIN	Pushed in
TIME/DIV(ms)	0.01
×10 HORIZ MAG	Pulled out

b. Square-wave generator fast-rise + output

Connect the square-wave generator fast-rise + Output connector to the V-IN connector through a 50-ohm BNC cable, a ×10 attenuator and a 50-ohm BNC termination.

c. Set the square-wave generator for a four-division display at 100 kilohertz.

d. Move the leading edge of the square-wave onto the viewing area with the horizontal POSITION control.

e. CHECK - The total aberrations of square-wave response of CRT display must not exceed 5% peak to peak.

13. Adjust Upper Vertical Bandwidth Limit

REQUIREMENT - Not more than -3dB at seven megahertz.

a. Change the following control settings;

TIME(ms)/DIV	0.01
×10 HORIZ MAG	Pulled in

b. Connect the high-frequency constant-amplitude sine wave generator to the V-IN connector through a 50-ohm BNC cable a × 10 BNC attenuator and a 50-ohm BNC termination.

c. Set the constant-amplitude generator for a four-division display, centered about the center horizontal line, at its reference frequency (50 kilohertz).

d. Without changing the output amplitude, increase the output frequency of the generator unit the display is reduced to 2.8 divisions (-3dB point).

e. CHECK - Output frequency of generator must be seven magahertz or higher.

f. ADJUST - Adjust to seven megahertz or heigher with Bandwidth adjustment, CV302.

g. Recheck step 12. If readjustment is necessary, recheck this step also.

14. Check × 5 Vertical Gain Upper Bandwidth Limit

REQUIREMENT - Not more than -3dB at 2 megahertz. (Only for V/DIV 0.1, 0.05)

a. Pull the ×5 VERT GAIN switch out.

b. Set the constant-amplitude generator for a four-division display, centered about the center horizontal line, at its reference frequency (50 kilohertz).

c. Without changing the output amplitude, increase the output frequency of the generator until the display is reduced to 2.8 divisions (-3dB point).

d. CHECK - Output frequency of generator must 2.0 megahertz or higher.

e. Disconnect all test equipment.

TRIGGER SYSTEM CALIBRATION

Vertical Controls		Horizontal Controls	
V/DIV	0.1	TIME(ms)/DIV	1
VARIABLE	CAL	Horizontal POSITION	Midrange
Vertical POSITION	Midrange	×10 HORIZ MAG	Pushed in
×5 VERT GAIN	Pushed in	VARIABLE (TOP COVER)	CAL
V-IN (side panel)	DC		

Triggering Controls		Horizontal Display Controls	
LEVEL	Midrange (pushed in)	H.DISP (side panel)	INT

SOURCE (side panel)	INT		
SLOPE (side panel)	+	CRT Controls	
DC REST	OFF	FOCUS (TOP cover)	Midrange
		INTEN.(TOP cover)	Midrange

Power Controls

POWER (TOP cover)	ON
POWER MODE (rear panel)	AC

15. Adjust Trigger Sensitivity

a. Connect the Medium - Frequency constant-amplitude sine wave generator to the V-IN connector through a 50-ohm BNC cable, a ×10 BNC attenuator and a 50-ohm BNC termination.

b. Set the constant-amplitude generator for a 0.6 division display at one kilohertz.

c. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

d. Turn the LEVEL control to full clockwise.

e. CHECK - The waveform is not observed on the CRT display.

f. Turn the LEVEL control to full counterclockwise.

g. CHECK - The waveform is not observed on the CRT display.

h. ADJUST - Set V-IN switch to 75 Ω. Rotate RV517 clockwise to find the point at which the trace just appears. Then, set SOURCE switch to LINE. Rotate RV517 clockwise to find the point at which the trace just disappears. Set RV517 in the center of the above points.

16. Adjust Trigger Slope and Level Centering

a. Change the following control settings;

V-IN (side panel)	DC
SOURCE (side panel)	INT
LEVEL	Midrange (Pushed in)

b. Set the constant-amplitude generator for a 0.6 division display at one kilohertz.

c. CHECK - Stable display should be obtained in both the + and - SLOPE without adjusting LEVEL control.

d. ADJUST - Adjust RV410 for stable display in both the + and - SLOPE without adjusting LEVEL control.

17. Check External Triggering Operation

a. Change the following control settings;

SOURCE (side panel)	EXT
SLOPE (side panel)	+
LEVEL	Midrange (Pushed in)

b. Connect the constant-amplitude sine wave generator to the V-IN connector through the 50-ohm BNC cable, 50-ohm BNC termination and the BNC T connector. Connect the output of the BNC T connector to the EXT TRIG INPUT connector with a 50-ohm BNC cable.

c. Set the constant-amplitude generator for a 3 division display (0.3 volts) at 30 hertz.

d. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

e. Set the constant-amplitude generator for a 3 division display (0.3 volts) at one megahertz.

f. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

g. Change the following Control settings;

V/DIV	0.2
×10 HORIZ MAG	Pulled in
TIME(ms)/DIV	0.05

h. Set the constant-amplitude generator for a 3 division display (0.6 volts), then change the frequency to seven megahertz without changing the amplitude setting.

i. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

j. Change the following control settings;

V/DIV	0.1
LEVEL	Midrange (pulled out)
×10 HORIZ MAG	Pushed in
TIME(ms)/DIV	1

k. Set the constant-amplitude generator for a 3 division display (0.3 volts) at 100 hertz.

l. CHECK - Stable CRT display is presented.

m. Set the constant-amplitude generator for a 3 division display (0.3 volts) at one kilohertz.

n. CHECK - Stable CRT display is presented.

o. Change the following Control settings;

V/DIV	0.2

p. Set the constant-amplitude generator for a 3 division display (0.6 volts), then change the frequency to seven megahertz without changing the amplitude setting.

q. CHECK - Stable CRT display is presented.

18. Check Internal Triggering Operation

a. Change the following Control settings;

V/DIV	0.1
SLOPE (side panel)	INT
SLOPE (side panel)	+
LEVEL	Midrange (Pushed in)

b. Connect the constant-amplitude sine wave generator to the V-IN connector through a 50-ohm BNC cable, a 50-ohm BNC termination.

c. Set the constant-amplitude generator for a 0.8 division display at 30 hertz.

d. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

e. Set the constant-amplitude generator for a 0.8 division display at one megahertz.

f. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

g. Set the constant-amplitude generator for a 1.7 division display at seven megahertz.

h. CHECK - That a stable display can just be obtained by rotating the LEVEL control.

i. Change the following Control settings;

×10 HORIZ MAG	Pushed in
TIME(ms)/DIV	1
LEVEL	Midrange (pulled out)

j. Set the constant-amplitude generator for a 0.8 division display at 100 hertz.

k. Stable CRT display is presented.

l. Set the constant-amplitude generator for a 0.8 division display at one megahertz.

m. CHECK - Stable CRT display is presented.

n. Change the following Control settings;

×10 HORIZ MAG	Pulled out
TIME(ms)/DIV	0.05

o. Set the constant-amplitude generator for a 1.7 division display at seven megahertz.

p. CHECK - Stable CRT display is presented.

HORIZONTAL SYSTEM CALIBRATION

Vertical Controls

V/DIV	1.0
VARIABLE	CAL
Vertical POSITION	Midrange
×5 VERT GAIN	Pushed in
V-IN (side panel)	DC

Trigger Controls

LEVEL	Midrange (pulled in)
SOURCE (side panel)	INT
SLOPE (side panel)	+

Power Controls

POWER (top cover)	ON
POWER MODE (rear panel)	AC

Horizontal Controls

TIME(ms)/DIV	1.0
Horizontal POSITION	Midrange
×10 HORIZ MAG	Pushed in
VARIABLE (top cover)	CAL

Horizontal Display Controls

H.DISP (side panel)	INT

CRT Controls

FOCUS (top cover)	Midrange
INTEN (top cover)	Midrange

19. Adjust Normal Timing

a. Connect the time-mark generator to the V-IN connector through a 50-ohm BNC cable, a 50-ohm BNC termination.

b. Set the time-mark generator for one-millisecond markers.

c. CHECK - CRT display one marker each division between the left- and right-vertical lines of the graticule. (See Fig. 3). Eleventh marker must be within 0.3 division (within ±3%) of the right vertical line with the first marker positioned exactly to the left vertical line.

d. ADJUST - ×1 Gain, RV803, for one marker each division. The first and eleventh markers must coincide exactly with their respective graticule lines (reposition the display slightly with the horizontal POSITION control if necessary).

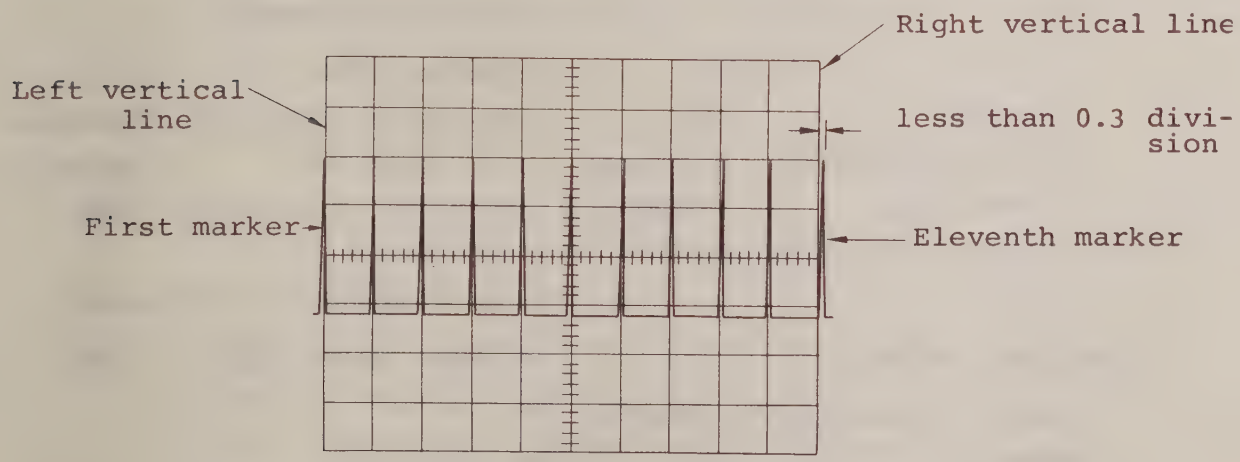


Fig. 3

20. Adjust Magnified Timing

a. Change the following Control settings;

×10 HORIZ MAG	Pulled out

b. Set the time-mark generator for 0.1 millisecond markers.

c. CHECK - CRT display one maker each division between the left- and right-vertical lines of the graticule (See Fig. 3). Eleventh marker must be with 0.5 division (within ±5%) of the right vertical line with the first marker positioned exactly to the left vertical line.

d. ADJUST - ×10 Gain, RV802, for one marker each division. The first and eleventh markers must coincide exactly with their respective graticule lines (reposition the display slightly with the horizontal POSITION control if necessary).

CALIBRATOR CALIBRATION

Vertical Controls

V/DIV	0.2
VARIABLE	CAL
Vertical POSITION	Midrange
×5 VERT GAIN	Pushed in
V-IN (side panel)	DC

Trigger Controls

LEVEL	Midrange (pulled in)
SOURCE	INT
SLOPE	+

Horizontal Controls

TIME(ms)/DIV	1.0
Horizontal POSITION	Midrange
×10 HORIZ MAG	Pushed in
VARIABLE (top cover)	CAL

Horizontal Display Controls

H.DISP (side panel)	INT

CRT Controls

FOCUS (TOP cover)	Midrange
INTEN (TOP cover)	Midrange

Power Controls

POWER (TOP cover)	ON
POWER MODE (rear panel)	AC

21. Adjust CALIBRATOR Output

a. Prepare 50-ohm cable (one end is BNC connector; the other alligator clip).

b. Connect the alligator clip between CAL OUT connector (post jack) and ground. Connect the BNC connector to V-IN.

c. CHECK - CRT display for four division of deflection.

d. ADJUST - CALIBRATOR Amplitude adjustment,RV1203, for exactly four division of deflection.

OTHER CALIBRATION

22. Adjust Batteries Protect

a. Change the following Control settings;

POWER MODE (rear panel) EXT DC

b. Connect DC Voltmeter to the external power supply.

c. Connect the external power supply for +10.0 Volts $\pm$0.1 Volt.

d. CHECK - Power lamp (front panel) indicates red clearly.

e. ADJUST - Control the external power supply for 10.3 Volts $\pm$ 0.1 Volt. Adjust RV1106 to the point where the power lamp indication changes from green to red.

23. Check External Graticule

a. Set the second horizontal line of the internal calibrations to the IRE "0" line of the external calibrations on the CRT display.

24. Check TV Mode Operation

a. Change the following Control settings;

Vertical Controls

V/DIV	0.2
VARIABLE	CAL
Vertical POSITION	Midrange
×5 VERT GAIN	Pushed in
V-IN (side panel)	75Ω

Trigger Controls

LEVEL	Midrange
SOURCE (side panel)	INT
SLOPE (side panel)	TV(-)
DC REST	ON

Power Controls

POWER (TOP cover)	ON
POWER MODE (rear panel)	AC

Horizontal Controls

TIME(ms)/DIV	2V or 2H
Horizontal POSITION	Midrange
×10 HORIZ MAG	Pushed in
VARIABLE (Top cover)	CAL

Horizontal Display Controls

H.DISP (side panel)	2V.2H

CRT Controls

FOCUS (TOP cover)	Midrange
INTEN (TOP cover)	Midrange

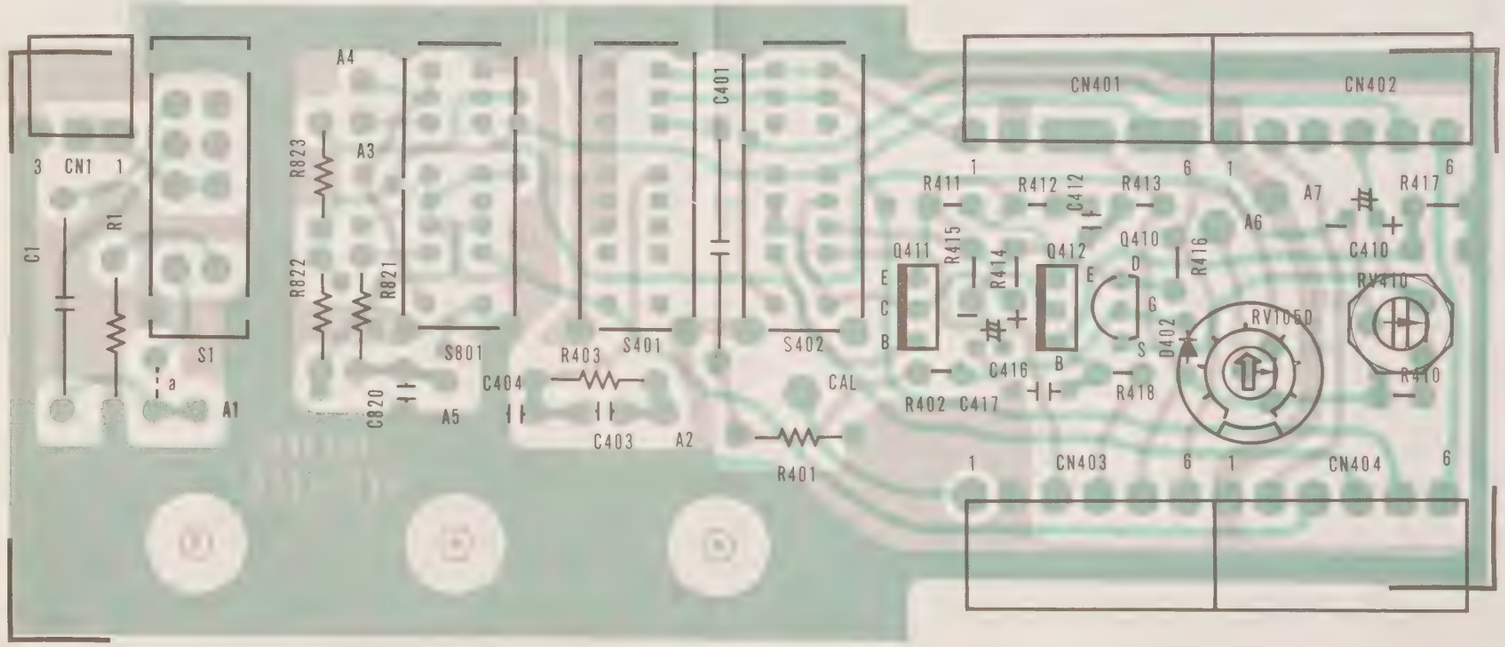
b. Connect the TV test signal generator output connector to the VERT INPUT connector with a 75-ohm BNC cable.

c. CHECK - TV signal is accurately measured by switching TIME(ms)/DIV to 2V or 2H.

ELECTRICAL REPLACEBLE PARTS LIST
AND CIRCUIT BOARD ILLUSTRATIONS (PEF-426)

Symbol	Description	Code	Qty	Remarks
	Capacitors			
C1	Plastic 400V 0.047μF	CQX0078	1	
C401	Plastic 400V 0.047μF	CQX0078	1	
C403	Mica 500V 68PF	CMF0052	1	
C404	Mica 500V 47PF	CMF0048	1	
C410	Elyc 16V 10μF	CEC0160	1	
C412	Film 50V 0.0022μF	CQM0018	1	
C416	Elyc 16V 10μF	CEC0160	1	
C417	Film 50V 0.047μF	CQM0033	1	
C820	Film 50V 0.001μF	CQM0016	1	
	Diodes			
D402	1S2075K	HDS0108	1	
	Resistors			
R1	Film 1/2W 75Ω±1%	RME0024	1	
R401	Carbon 1/8W 510kΩ±5%	RCR1068	1	
R402	" 1/8W 100Ω±5%	RCR1117	1	
R403	" 1/8W 470kΩ±5%	RCR1060	1	
R410	" 1/4W 15kΩ±5%	RCR0616	1	
R411	" 1/8W 68Ω±5%	RCR1224	1	
R412	" 1/4W 33Ω±5%	RCR0654	1	
R413	" 1/4W 1.8kΩ±5%	RCR0599	1	
R414	" 1/4W 1kΩ±5%	RCR0601	1	
R415	" 1/4W 1kΩ±5%	RCR0601	1	
R416	" 1/4W 390Ω±5%	RCR0663	1	
R417	" 1/4W 1kΩ±5%	RCR0601	1	
R418	" 1/4W 7.5kΩ±5%	RCR0693	1	
R821	" 1/8W 4.7kΩ±5%	RCR1052	1	
R822	" 1/8W 560Ω±5%	RCR1071	1	
R823	Carbon 1/8W 560Ω±5%	RCR1071	1	

Symbol	Description	Code	Qty	Remarks
RV410	Var, Film 2kΩ	RNT0033	1	
RV1050	Var, Wirewood 3/4W 5kΩ	RXX0045	1	
	Transistors			
Q410	2SK30AY	HTK0011	1	
Q411	2SC1906	HTC0338	1	
Q412	2SC1906	HTC0338	1	
	Switches			
S1	SL-223B4 L=6	SSV0013	1	
S401	SSP043 L=6	SSV0031	1	
S402	SSP043 L=6	SSV0031	1	
S801	SSP043 L=6	SSV0031	1	
	Connectors			
CN1	A-2145-3GA	JBX0109	1	
CN401	A-2145-6GA	JBX0029	1	
CN402	A-2145-6GA	"	1	
CN403	A-2145-6GA	"	1	
CN404	A-2145-6GA	JBX0029	1	



ELECTRICAL REPLACEABLE PARTS LIST AND CIRCUIT BOARD ILLUSTRATIONS (PEF-428)

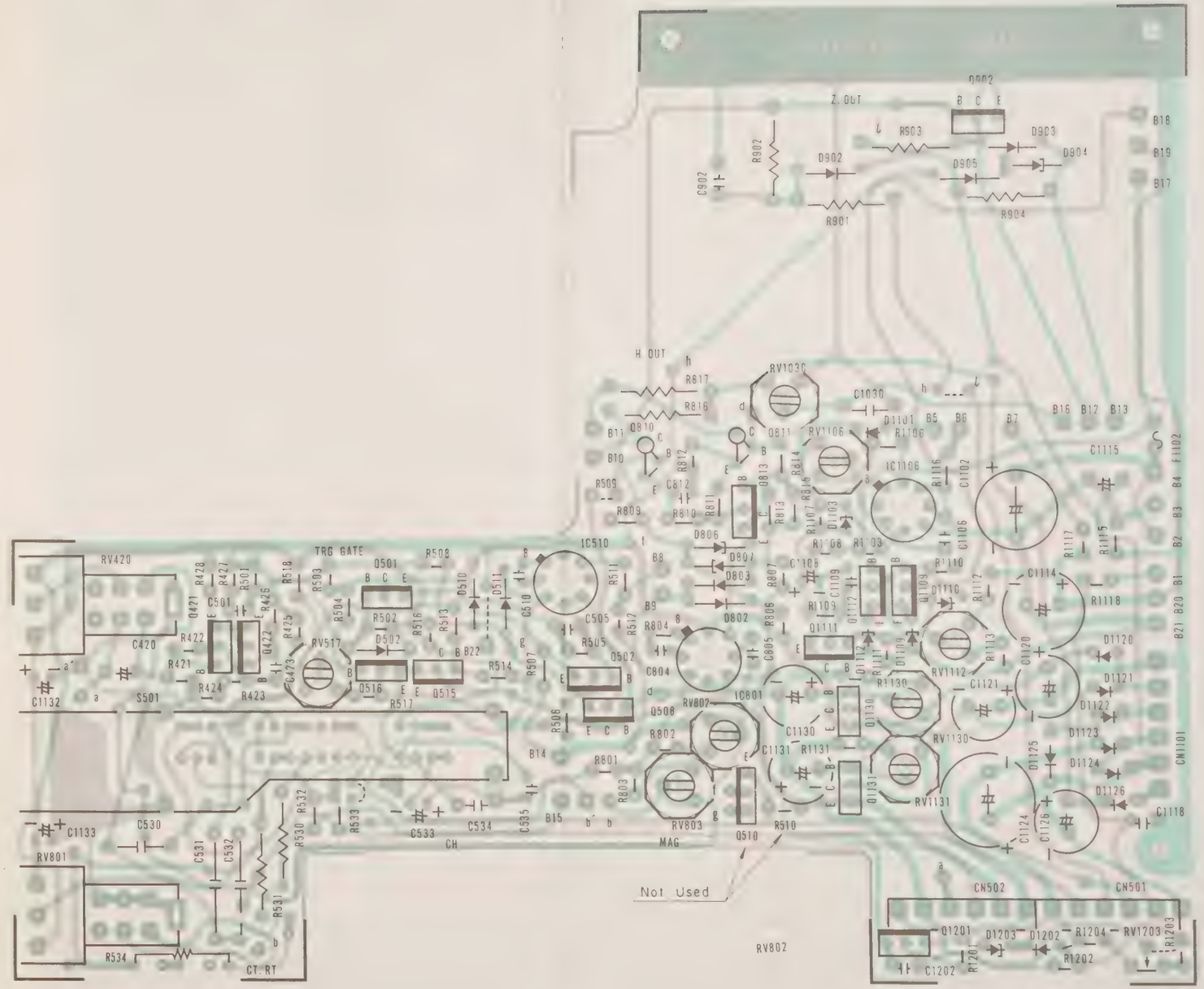
Symbol	Description	Code	Qty	Remarks	Symbol	Description	Code	Qty	Remarks
	Capacitors				C1202	Mica 500V 68PF	CMF0052	1	
C420	Elyc 25V 0.47μF	CEC0330	1		C1030	Ceramic 500V 4700PF	CCC0593	1	
C423	Mica 500V 47PF	CMF0048	1						
C501	Mica 500V 27PF	CMF0040	1			Connectors			
C505	Mica 500V 47PF	CMF0048	1		CN501	2461-6GC	ETZ0029	1	
C510	Mica 500V 47PF	CMF0048	1		CN502	2461-6GC	ETZ0029	1	
C530	Plastic 100V 0.1μF	CQQ0015	1		CN1101	2461-6GC	ETZ0029	1	
C531	Film 50V 20000PF	CQQ0016	1						
C532	Film 50V 1000PF	CQQ0010	1			Diodes			
C533	Elyc 25V 2.2μF	CEC0179	1		D502	1N34AH	HDN0006	1	
C534	Film 50V 0.1μF	CQM0023	1		D510	MA161	HDM0051	1	
C804	Film 50V 0.0022μF	CQM0018	1		D511	MA161	HDM0051	1	
C812	Film 50V 0.001μF	CQM0016	1		D806	HZ5B	HDH0029	1	
C535	Film 50V 0.0047μF	CQM0020	1		D807	HZ5B	HDH0029	1	
C805	Mica 500V 75PF	CMF0054	1		D802	1S2075K	HDS0108	1	
					D803	1S2075K	HDS0108	1	
C1102	Elyc 25V 2200μF	CES0001	1		D902	1S2076A	HDS0110	1	
C1108	Elyc 25V 4.7μF	CEC0186	1		D903	1S2076A	HDS0110	1	
C1109	Mica 500V 100PF	CMF0068	1		D904	HZ22	HDH0072	1	
C1114	Elyc 16V 470μF	CEC0171	1		D905	HZ22	HDH0072	1	
C1115	Elyc 25V 1μF	CEC0173	1	Bipolar	D1103	HZ5B	HDH0029	1	
C1118	Film 50V 0.001μF	CQM0016	1		D1109	HZ9A	HDH0045	1	
C1106	Film 50V 0.01μF	CQM0028	1		D1112	HZ7A	HDH0039	1	
C1120	Elyc 25V 100μF	CEC0177	1		D1120	1S2076A	HDS0110	1	
C1121	Elyc 25V 100μF	CEC0177	1		D1121	1S2076A	HDS0110	1	
C1124	Elyc 160V 22μF	CEC0216	1		D1122	V11J	HDV0026	1	
C1126	Elyc 50V 33μF	CEC0198	1		D1123	V11J	HDV0026	1	
C1130	Elyc 16V 100μF	CEC0161	1		D1124	V11J	HDV0026	1	
C1131	Elyc 16V 100μF	CEC0161	1		D1125	V11J	HDV0026	1	
C1132	Elyc 16V 10μF	CEC0160	1		D1126	V06C	HDV0019	1	
C1133	Elyc 16V 10μF	CEC0160	1		D1202	1S2075K	HDS0108	1	

Symbol	Description	Code	Qty	Remarks
D1203	HZ7A	HDH0039	1	
D1110	HZ5B	HDH0029	1	
D1101	1S2075K	HDS0108	1	
	Fuse			
F1102	FR-11 125V 3A	EFL0019	1	
	IC's			
IC510	CA3130T	ILC0027	1	
IC801	μA709HC	ILM0005	1	
IC1106	741HC	ILX0024	1	
	Transistors			
Q421	2SC641K	HTC0192	1	
Q422	2SC641K	HTC0192	1	
Q501	2SC458C	HTC0148	1	
Q502	2SC458C	HTC0148	1	
Q508	2SC641K	HTC0192	1	
Q515	2SC458C	HTC0148	1	
Q516	2SC458C	HTC0148	1	
Q810	2SC154C	HTC0089	1	
Q811	2SC154C	HTC0089	1	
Q813	2SC458C	HTC0148	1	
Q902	2SC1515K	HTC0315	1	
Q1109	2SC458C	HTC0148	1	
Q1111	2SC458C	HTC0148	1	
Q1112	2SC458C	HTC0148	1	
Q1130	2SC1213C	HTC0057	1	
Q1131	2SA673C	HTA0085	1	
Q1201	2SA781K	HTA0099	1	

Symbol	Description	Code	Qty	Remarks
	Resistors			
R421	Carbon 1/4W 100kΩ±5%	RCR0606	1	
R422	" 1/4W 47kΩ±5%	RCR0671	1	
R423	" 1/4W 10kΩ±5%	RCR0604	1	
R424	" 1/4W 12kΩ±5%	RCR0610	1	
R425	" 1/4W 1.2kΩ±5%	RCR0592	1	
R426	" 1/4W 33kΩ±5%	RCR0655	1	
R427	" 1/4W 470Ω±5%	RCR0673	1	
R428	" 1/4W 8.2kΩ±5%	RCR0698	1	
R501	" 1/4W 220kΩ±5%	RCR0639	1	
R502	" 1/4W 3.3kΩ±5%	RCR0648	1	
R503	Carbon 1/4W 5.6kΩ±5%	RCR0677	1	
R504	Film 1/8W 3.74kΩ±1%	RMR2273	1	
R505	Film 1/8W 4.64kΩ±1%	RMR2202	1	
R506	Film 1/8W 10kΩ±1%	RMR2204	1	
R507	Film 1/8W 2.75kΩ±1%	RMR2205	1	
R508	Carbon 1/4W 27kΩ±5%	RCR0644	1	
R511	Film 1/8W 7.87kΩ±1%	RMR2206	1	
R512	Carbon 1/4W 24kΩ±5%	RCR0641	1	
R513	Film 1/8W 3.01kΩ±1%	RMR2470	1	
R514	Film 1/8W 2.87kΩ±1%	RMR1898	1	
R516	Carbon 1/4W 27kΩ±5%	RCR0644	1	
R517	" 1/4W 10kΩ±5%	RCR0604	1	
R518	Carbon 1/4W 20kΩ±5%	RCR0634	1	
R530	Film 1/2W 3MΩ±1%	RMR2210	1	
R531	" 1/2W 750kΩ±1%	RME0026	1	
R532	Film 1/8W 150kΩ±1%	RMR2209	1	
R533	Carbon 1/4W 680kΩ±5%	RCR0692	1	
R534	Film 1/2W 1.07MΩ±1%	RMR2211	1	

Symbol	Description	Code	Qty	Remarks
R801	Carbon 1/4W 16kΩ±5%	RCR0620	1	
R802	" 1/4W 15kΩ±5%	RCR0616	1	
R803	" 1/4W 1.5kΩ±5%	RCR0596	1	
R804	" 1/4W 1.5kΩ±5%	RCR0596	1	
R806	" 1/4W 4.7kΩ±5%	RCR0667	1	
R807	" 1/4W 8.2kΩ±5%	RCR0698	1	
R809	Carbon 1/4W 100Ω±5%	RCR0605	1	
R810	Film 1/8W 499Ω±1%	RMR1963	1	
R811	Film 1/8W 499Ω±1%	RMR1963	1	
R812	Carbon 1/4W 220Ω±5%	RCR0638	1	
R813	Film 1/8W 2.49kΩ±1%	RMR2208	1	
R814	" 1/8W 4.64kΩ±1%	RMR2202	1	
R815	" 1/8W 10kΩ±1%	RMR2204	1	
R816	" 1W 47kΩ±2%	RMR2199	1	
R817	" 1W 47kΩ±2%	RMR2199	1	
R512	Film 1/4W 23.7kΩ±1%	RME0470	1	
R901	Carbon 1/4W 10kΩ±5%	RCR0460	1	
R902	" 1/4W 10kΩ±5%	RCR0460	1	
R903	" 1/4W 180kΩ±5%	RCR0486	1	
R904	" 1/4W 100kΩ±5%	RCR0462	1	
R1103	" 1/4W 3.3kΩ±5%	RCR0648	1	
R1106	" 1/4W 4.7kΩ±5%	RCR0667	1	
R1107	" 1/4W 3.6kΩ±5%	RCR0649	1	
R1108	" 1/4W 2.2kΩ±5%	RCR0626	1	
R1109	" 1/4W 6.8kΩ±5%	RCR0686	1	
R1110	" 1/4W 10kΩ±5%	RCR0604	1	
R1111	" 1/4W 4.7kΩ±5%	RCR0667	1	
R1112	" 1/4W 2.2kΩ±5%	RCR0626	1	
R1113	" 1/4W 8.2kΩ±5%	RCR0698	1	
R1115	" 1/4W 10kΩ±5%	RCR0604	1	

Symbol	Description	Code	Qty	Remarks
R1116	Carbon 1/4W 680Ω±5%	RCR0691	1	
R1117	" 1/4W 390Ω±5%	RCR0663	1	
R1118	" 1/4W 2.7MΩ±5%	RCR1925	1	
R1130	" 1/4W 2.2kΩ±5%	RCR0626	1	
R1131	" 1/4W 2.2kΩ±5%	RCR0626	1	
R1201	" 1/4W 4.7kΩ±5%	RCR0667	1	
R1202	" 1/4W 2.2kΩ±5%	RCR0626	1	
R1203	" 1/4W 6.2kΩ±5%	RCR0684	1	
R1204	Carbon 1/4W 750Ω±5%	RCR0696	1	
RV420	Var. Carbon 10kΩB	8193978-A	1	
RV517	Var. Film 5kΩB	RNT0037	1	
RV802	Var. Film 10kΩB	RNT0031	1	
RV803	Var. Film 1kΩB	RNT0029	1	
RV801	Var. Carbon 10kΩB	8193978-A	1	
RV1106	Var. Film 2kΩB	RNT0033	1	
RV1112	" 2kΩB	RNT0033	1	
RV1130	" 500ΩB	RNT0039	1	
RV1131	" 500ΩB	RNT0039	1	
RV1203	" 500ΩB	RNT0026	1	
RV1030	Var. Film 200kΩB	RNT0035	1	
	Switches			
S501	SRZ-V046-15R(12.5)	SSR0148	1	



ELECTRICAL REPLACEABLE PARTS LIST AND CIRCUIT BOARD ILLUSTRATIONS (PEF-427)

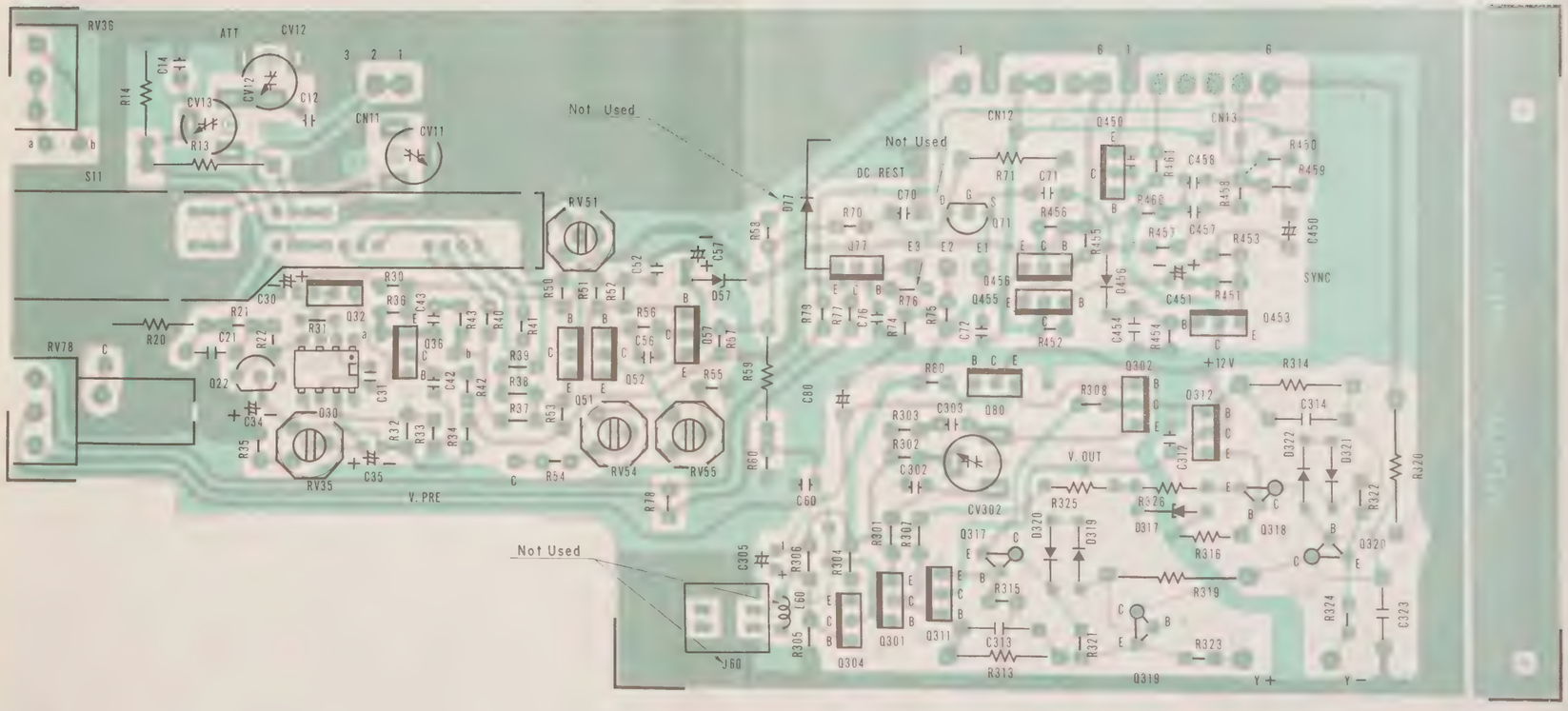
Symbol	Description	Code	Qty	Remarks
	Capacitors			
C12	Mica 500V 10PF	CMF0011	1	
C14	Mica 500V 33PF	CMF0043	1	
C21	Ceramic 500V 4700PF	CCC0593	1	
C30	Elyc 16V 10μF	CEC0160	1	
C31	Film 50V 0.0047μF	CQM0020	1	
C34	Elyc 16V 10μF	CEC0160	1	
C35	Elyc 16V 10μF	CEC0160	1	
C42	Film 50V 0.0022μF	CQM0018	1	
C43	Mica 500V 10PF	CMF0011	1	
C60	Mica 500V 15PF	CMF0017	1	
C52	Film 50V 0.0022μF	CQM0018	1	
C56	Mica 500V 7PF	CMF0007	1	
C57	Elyc 16V 10μF	CEC0160	1	
C70	Mica 500V 100PF	CMF0068	1	
C71	Mica 500V 100PF	CMF0068	1	
C72	Film 50V 0.0022μF	CQM0018	1	
C76	Film 50V 0.01μF	CQM0028	1	
C80	Elyc 25V 1μF	CEC0173	1	Bipolar
C302	Mica 500V 22PF	CMF0024	1	
C305	Elyc 16V 10μF	CEC0160	1	
C312	Film 50V 0.022μF	CQM0031	1	
C313	Ceramic 500V 2.2PF	CCE0004	1	
C314	" 500V 2.2PF	CCE0004	1	
C323	Ceramic 500V 10000PF	CCC0591	1	
C450A	Mica 500V 33PF	CMF0043	1	
C450	Elyc 25V 1μF	CEC0173	1	Bipolar
C451	Elyc 50V 1μF	CEC0191	1	
C454	Film 50V 0.068μF	CQM0034	1	
C457	Film 50V 0.0047μF	CQM0020	1	
C458	Film 50V 0.0015μF	CQM0017	1	
CV11	Var. Ceramic 550V 10PF	CVE0004	1	
CV12	" 550V 10PF	CVE0004	1	
CV13	" 550V 10PF	CVE0004	1	
CV302	Var. Ceramic 550V 30PF	CVE0015	1	
	Connectors			
CN11	2461-3GC	ETZ0047	1	
CN12	2461-6GC	ETZ0029	1	
CN13	2461-6GC	ETZ0029	1	
	Diodes			
D319	1S2075K	HDS0108	1	
D320	"	HDS0108	1	
D321	"	HDS0108	1	
D322	"	HDS0108	1	
D456	1S2075K	HDS0108	1	
D317	HZ5B	HDH0029	1	
D57	HZ5B	HDH0029	1	
	Transistors			
Q22	2SK30AY	HTK0011	1	
Q30	E412S-A	HTE0004	1	
Q36	2SA836D	HTA0105	1	
Q51	2SC458C	HTC0148	1	
Q52	2SC458C	HTC0148	1	
Q57	2SA836D	HTA0105	1	

Symbol	Description	Code	Qty	Remarks
Q71	2SK30AY	HTK0011	1	
Q77	2SA836E	HTA0110	1	
Q80	2SC458C	HTC0148	1	
Q32	"	"	1	
Q301	"	"	1	
Q302	"	"	1	
Q311	"	"	1	
Q312	2SC458C	HTC0148	1	
Q317	2SC154C	HTC0089	1	
Q318	"	"	1	
Q319	"	"	1	
Q320	2SC154C	HTC0089	1	
Q304	2SC458C	HTC0148	1	
Q453	2SC458C	HTC0148	1	
Q455	2SA836D	HTA0105	1	
Q456	2SC641K	HTC0192	1	
Q450	2SC458C	HTC0148	1	
	Resistors			
R13	Film 1/2W 900kΩ±0.5%	RMC0072	1	
R14	Film 1/4W 111kΩ±0.5%	RMC0007	1	
R20	Film 1/2W 1MΩ±1%	RME0025	1	
R21	Carbon 1/4W 470kΩ±5%	RCR0674	1	
R22	" 1/4W 220Ω±5%	RCR0638	1	
R30	Carbon 1/4W 220Ω±5%	RCR0638	1	
R31	Film 1/8W 475Ω±1%	RMR2353	1	
R32	Film 1/8W 475Ω±1%	RMR2353	1	
R33	Carbon 1/4W 68kΩ±5%	RCR0690	1	
R34	" 1/4W 22Ω±5%	RCR0636	1	
R35	" 1/4W 68kΩ±5%	RCR0690	1	

Symbol	Description	Code	Qty	Remarks
R36	Carbon 1/4W 2.7kΩ±5%	RCR0631	1	
R37	Film 1/8W 511Ω±0.5%	RMR2200	1	
R38	" 1/8W 255Ω±0.5%	RMR2201	1	
R39	Film 1/8W 255Ω±0.5%	RMR2201	1	
R40	Carbon 1/4W 270Ω±5%	RCR0645	1	
R41	" 1/4W 68Ω±5%	RCR0689	1	
R42	" 1/4W 1.2kΩ±5%	RCR0592	1	
R43	Carbon 1/4W 680Ω±5%	RCR0691	1	
R50	Carbon 1/4W 1.5MΩ±5%	RCR0597	1	
R51	" 1/4W 2.2kΩ±5%	RCR0626	1	
R52	" 1/4W 33Ω±5%	RCR0654	1	
R53	" 1/4W 3.3kΩ±5%	RCR0648	1	
R54	" 1/4W 39Ω±5%	RCR0661	1	
R55	" 1/4W 270Ω±5%	RCR0645	1	
R56	" 1/4W 1.2kΩ±5%	RCR0592	1	
R57	" 1/4W 1.8kΩ±5%	RCR0599	1	
R58	" 1/4W 330Ω±5%	RCR0657	1	
R59	" 1/4W 680Ω±5%	RCR0691	1	
R60	" 1/4W 22kΩ±5%	RCR0637	1	
R70	Carbon 1/4W 1kΩ±5%	RCR0601	1	
R71	Composition 1/2W 10MΩ±5%	RSR0003	1	
R74	Carbon 1/4W 1kΩ±5%	RCR0601	1	
R75	" 1/4W 39kΩ±5%	RCR0662	1	
R77	" 1/4W 270Ω±5%	RCR0645	1	
R79	" 1/4W 120kΩ±5%	RCR0612	1	
R80	" 1/4W 22kΩ±5%	RCR0637	1	
R78	Carbon 1/4W 10kΩ±5%	RCR0604	1	
R301	Film 1/8W 887Ω±1%	RMR1955	1	
R302	Carbon 1/4W 270Ω±5%	RCR0645	1	

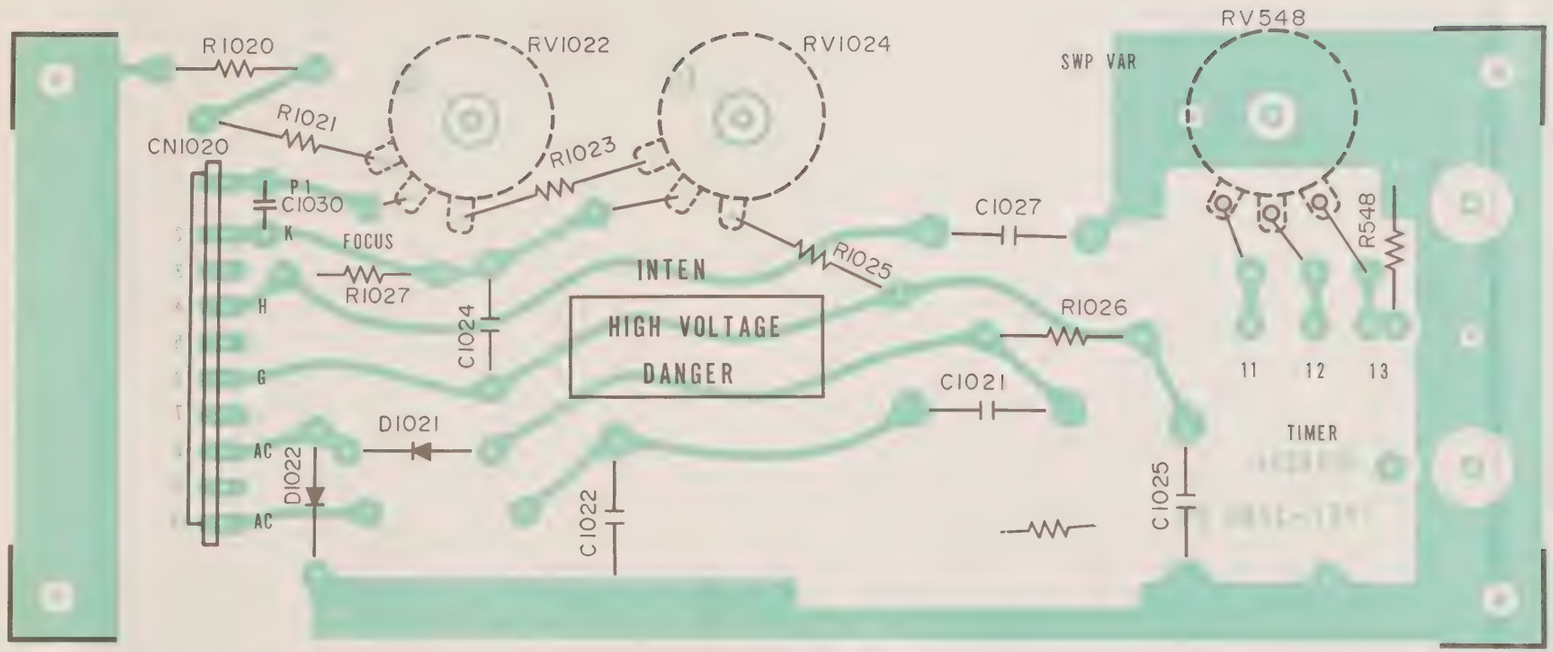
Symbol	Description	Code	Qty	Remarks
R304	Film 1/8W 1kΩ±1%	RMR1905	1	
R305	" 1/8W 4.64kΩ±1%	RMR2202	1	
R306	Film 1/8W 4.64kΩ±1%	RMR2022	1	
R307	Carbon 1/4W 150kΩ±5%	RCR0619	1	
R308	Carbon 1/4W 150kΩ±5%	RCR0619	1	
R313	Film 1W 22kΩ±2%	RMR2198	1	
R314	Film 1W 22kΩ±2%	RMR2198	1	
R315	Carbon 1/4W 1.5kΩ±5%	RCR0596	1	
R316	Carbon 1/8W 1.5kΩ±5%	RCR0980	1	
R319	Film 2W 15kΩ±5%	RMR1717	1	
R320	Film 2W 15kΩ±5%	RMR1717	1	
R321	Carbon 1/4W 330Ω±5%	RCR0657	1	
R322	" 1/4W 330Ω±5%	"	1	
R323	" 1/4W 330Ω±5%	"	1	
R324	Carbon 1/4W 330Ω±5%	RCR0657	1	
R450	Carbon 1/4W 4.7kΩ±5%	RCR0667	1	
R451	" 1/4W 4.7kΩ±5%	RCR0667	1	
R452	" 1/4W 150kΩ±5%	RCR0619	1	
R453	" 1/4W 47kΩ±5%	RCR0671	1	
R454	" 1/4W 220kΩ±5%	RCR0639	1	
R325	" 1/4W 47Ω±5%	RCR1057	1	
R326	Carbon 1/4W 47Ω±5%	RCR1057	1	
R455	Carbon 1/4W 22kΩ±5%	RCR0637	1	
R456	" 1/4W 4.7kΩ±5%	RCR0667	1	
R457	" 1/4W 15kΩ±5%	RCR0616	1	
R458	" 1/4W 10kΩ±5%	RCR0604	1	
R459	" 1/4W 150kΩ±5%	RCR0619	1	

Symbol	Description	Code	Qty	Remarks
R460	Carbon 1/4W 100kΩ±5%	RCR0606	1	
R461	Carbon 1/4W 33kΩ±5%	RCR0655	1	
RV35	Var. Film 1kΩB	RNT0029	1	
RV36	Var. Carbon 2kΩB	RDV0078	1	
RV54	Var. Film 100ΩB	RNT0028	1	
RV55	Var. Film 500ΩB	RNT0039	1	
RV78	Var. Carbon 10kΩB	8193978-A	1	
RV51	Var. Film 5kΩB	RNT0037	1	
	Switches			
S11	SRZ-V046-15R(12.5)	SSR0148	1	
S12	SRZ-V086-15R(12.5)	SSR0101	1	



ELECTRICAL REPLACEABLE PARTS LIST AND CIRCUIT BOARD ILLUSTRATIONS (PEF-376)

Symbol	Description	Code	Qty	Remarks
	Capacitors			
C1021	CERAMIC 1KV 4700PF	CCC0597	1	
C1022	CERAMIC 1KV 4700PF	CCC0597	1	
C1024	PLSTC 200V 0.1μF	COX0066	1	
C1025	CERMIC 2KV 4700PF	CCC0603	1	
C1027	CERMIC 2KV 1000PF	CCC0599	1	
C1030	CERMIC 2KV 220PF	CCC0578	1	
	Diodes			
D1021	Y-16	HDY0003	1	
D1022	Y-16	HDY0003	1	
	Resistors			
R1019	Carbon 1/4W100KΩ±5%	RCR0462	1	
R1020	" 1W3.3M[illegible]	RCR1763	1	
R1021	" 1W3.3M[illegible]	RCR1763	1	
R1023	" 1/4W2.2MΩ±5%	RCR0490	1	
R1025	" 1/4W 24KΩ±5%	RCR0503	1	
R1026	" 1/4W 22KΩ±5%	RCR0499	1	
R1027	" 1/4W100KΩ±5%	RCR0462	1	
R1028	" 1/4W 10KΩ±5%	RCR0460	1	
R 548	Carbon 1/4W1.8KΩ±5%	RCR0457	1	
RV1022	Var, Carbon V16-1MΩ	RDV0087	1	
RV1024	" V16 -500KΩ	RDV0089	1	
RV 548	Var, Carbon V16 -10KΩ	RDV0156	1	
	Connectors			
CN1021	129-10-11-281P	JMX0096	1	

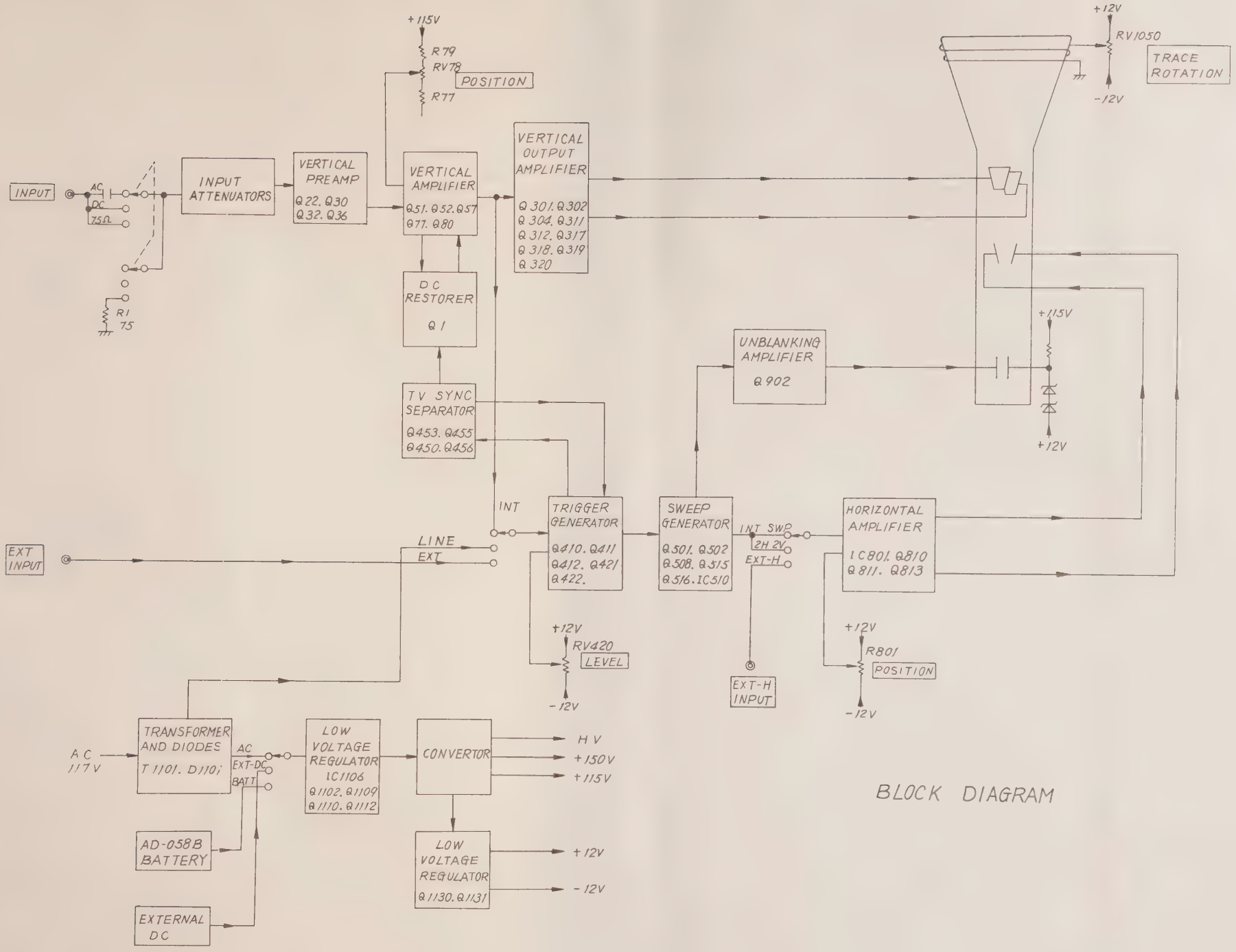


ELECTRICAL REPLACEABLE PARTS LIST (CHASSIS)

Symbol	Description	Code	Qty	Remarks
	Diodes			
D1101	5B1	HDB0010	1	
D1106	BD-707RG	HDB0019	1	
	Fuse			
F1101	F106 125V 0.5A	EFL0026	1	
	Coil			
L1001	Trace rotation	8207143	1	
	Connectors			
J1	UG-625/U	JHU0003	1	
J401	UG-625/U	JHU0003	1	
J801	UG-625/U	JHU0003	1	
CN1101	SB-14-36	DYS0009	1	
CN1103	RS-9109R6M	JMR0097	1	
CN1102	2139-6	JBX0003	1	
CN1021	128-10-10-281S	JMX0063	1	
J1101	TJ-4(red)	JJT0020	1	
J1102	TJ-4(black)	JJT0019	1	
-	2125TL(02-05-1217)	ETZ0054	7	
-	2578-TL	JYX0051	6	
	Transistors			
Q1102	2SA671C	HTA0079	1	
	Resistors			
R820	Film 1w15KΩ±5%	RMR1687	1	
	Switches			
S12	SSB022	SSV0032	1	
S1101	MSL-203N	SSS0016	1	
S1102	SL83-10-2-3	SSV0046	1	

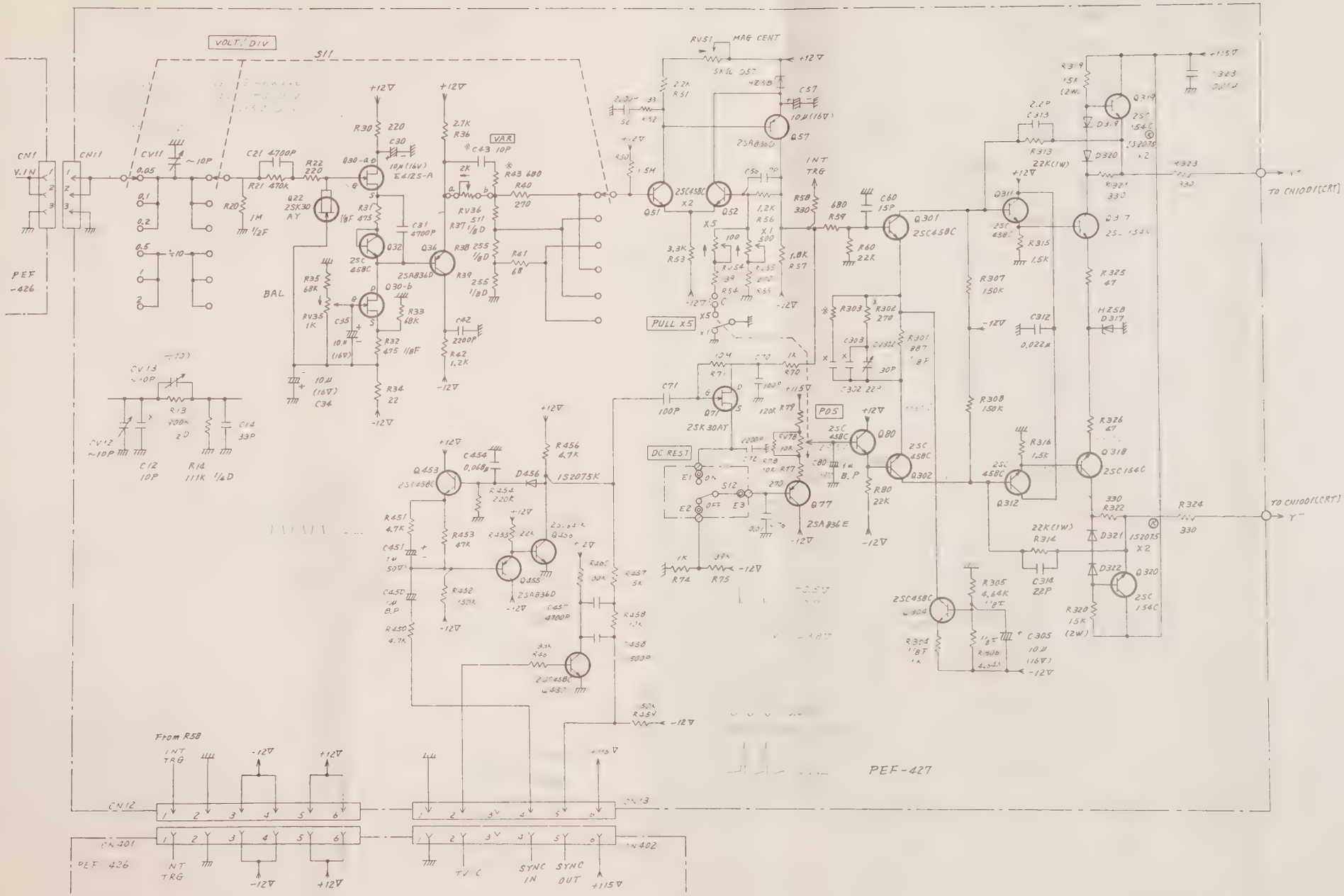
ELECTRICAL REPLACEABLE PARTS LIST (AD-058B)

Symbol	Description	Code	Qty	Remarks
	Transformers			
T1101	Power	940377 ∿78	1	
T1101	Converter	819341 ∿44	1	
	Electron Tube			
V1001	C.R.T 95AB31	DPX0010	1	
	Cable			
-	A.C. Line Cable	-	1	
	Battery			
	TY-356C	EBG0002	2	
	Cable			
	TY356CX2	EBY0011	1	
	Charger			
	BQ-012T06	EBJ0003	1	
	Diode			
D1301	SR103D	HDS0234	1	
	Resistors			
R1302	Carbon 1/4W56Ω±5%	RCR3022	1	
R1301	Wirewound 5W5.1Ω±5%	RWM0123	1	
	Connectors			
	RS-919LP6F	8293299		
	Fuse			
	250V 3A	EFG0355	1	
	Fuseholder			
	SN1102-4	EFH0185	1	

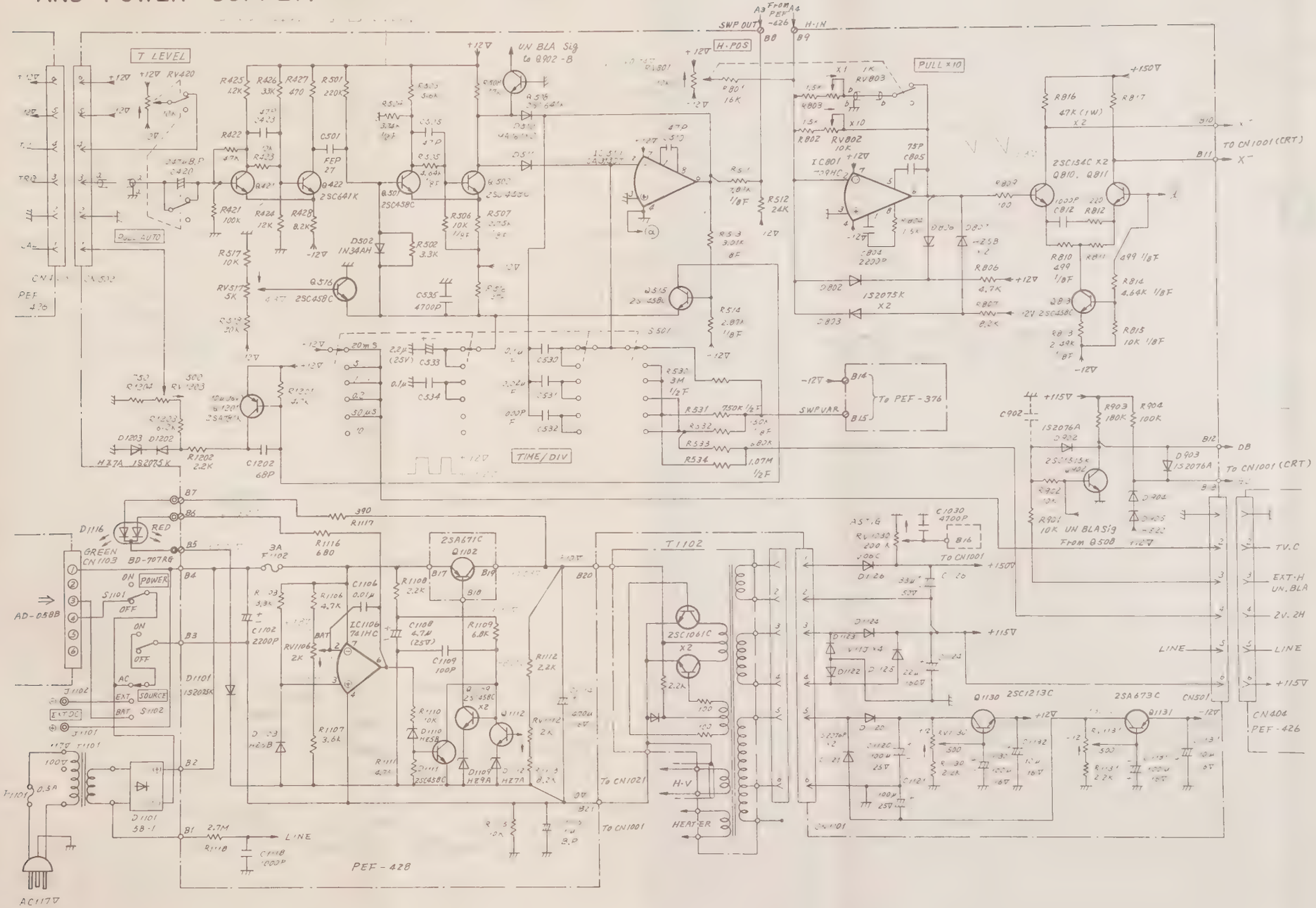


BLOCK DIAGRAM

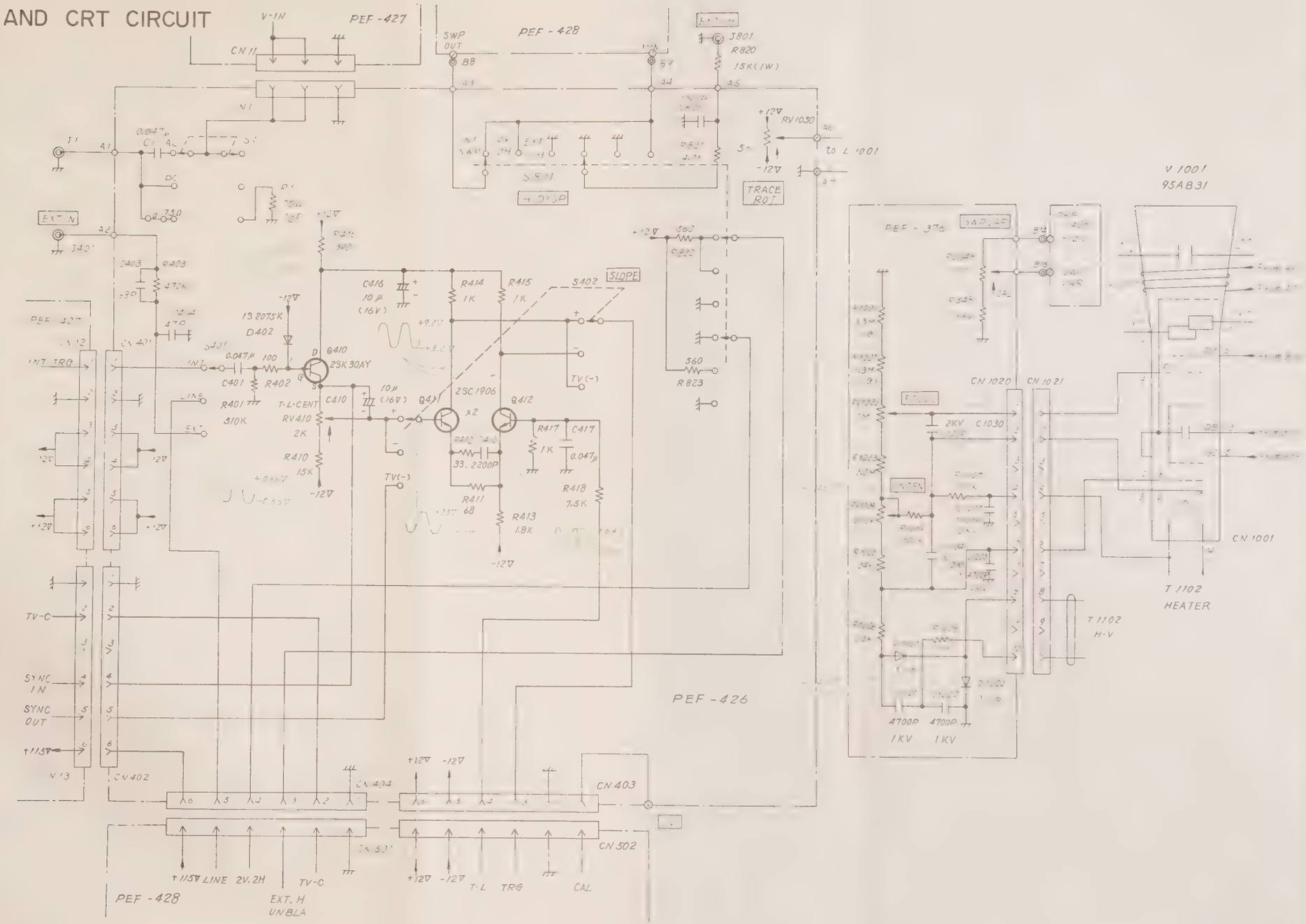
VERTICAL AMPLIFIER



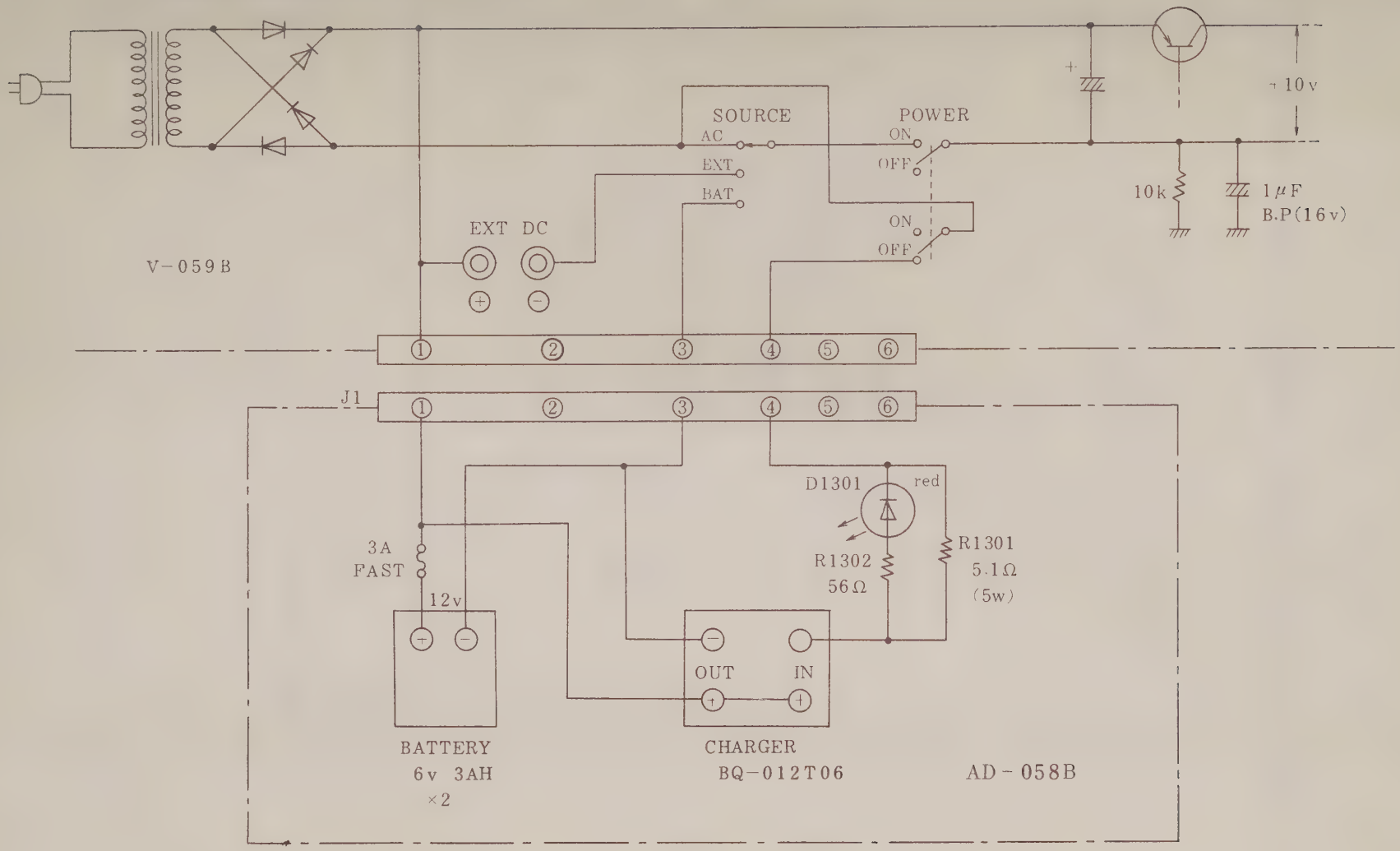
SWEEP GENERATOR, HORIZONTAL AMPLIFIER AND POWER SUPPLY.



TRIGGER GENERATOR AND CRT CIRCUIT

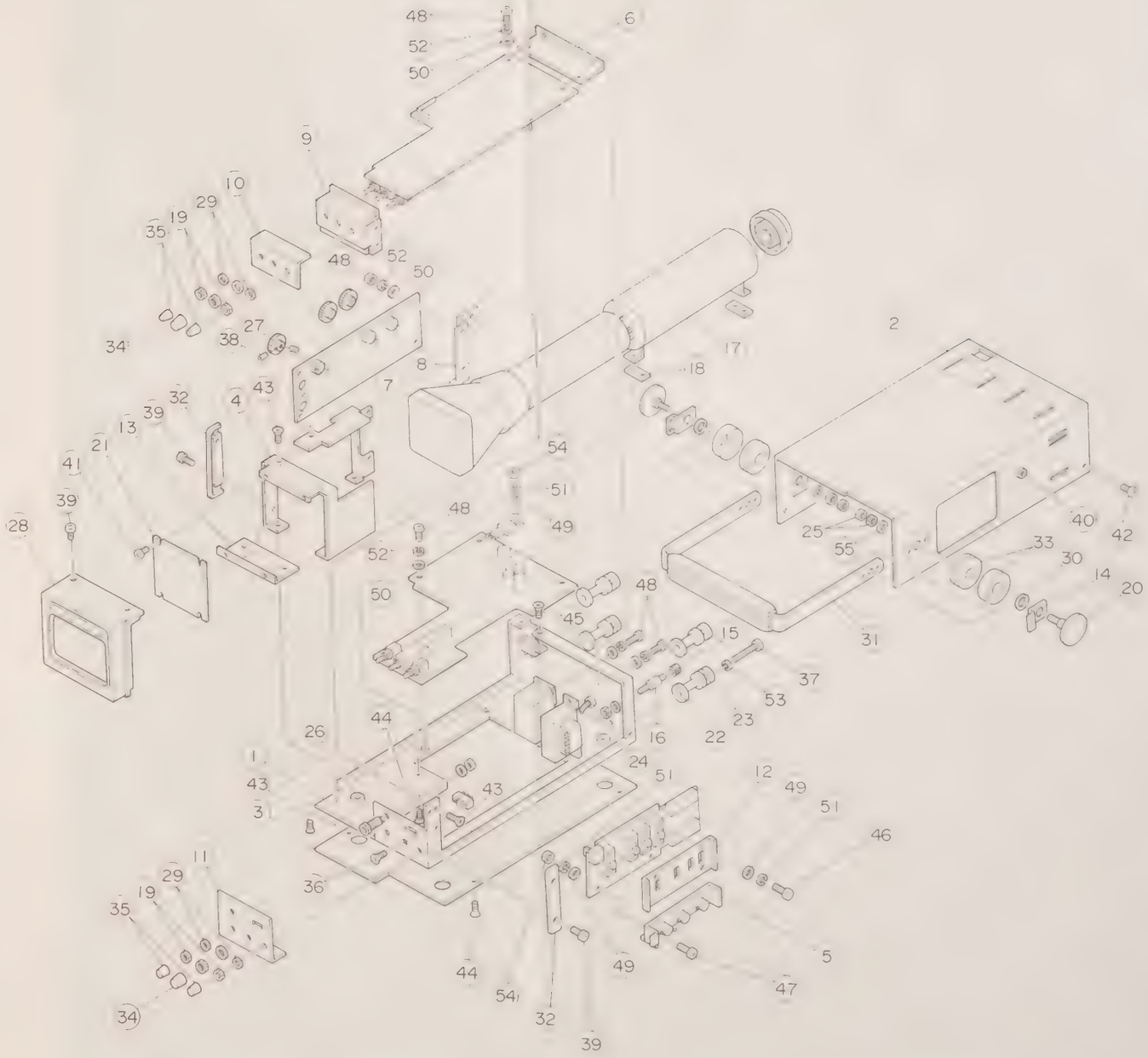


POWER SUPPLY



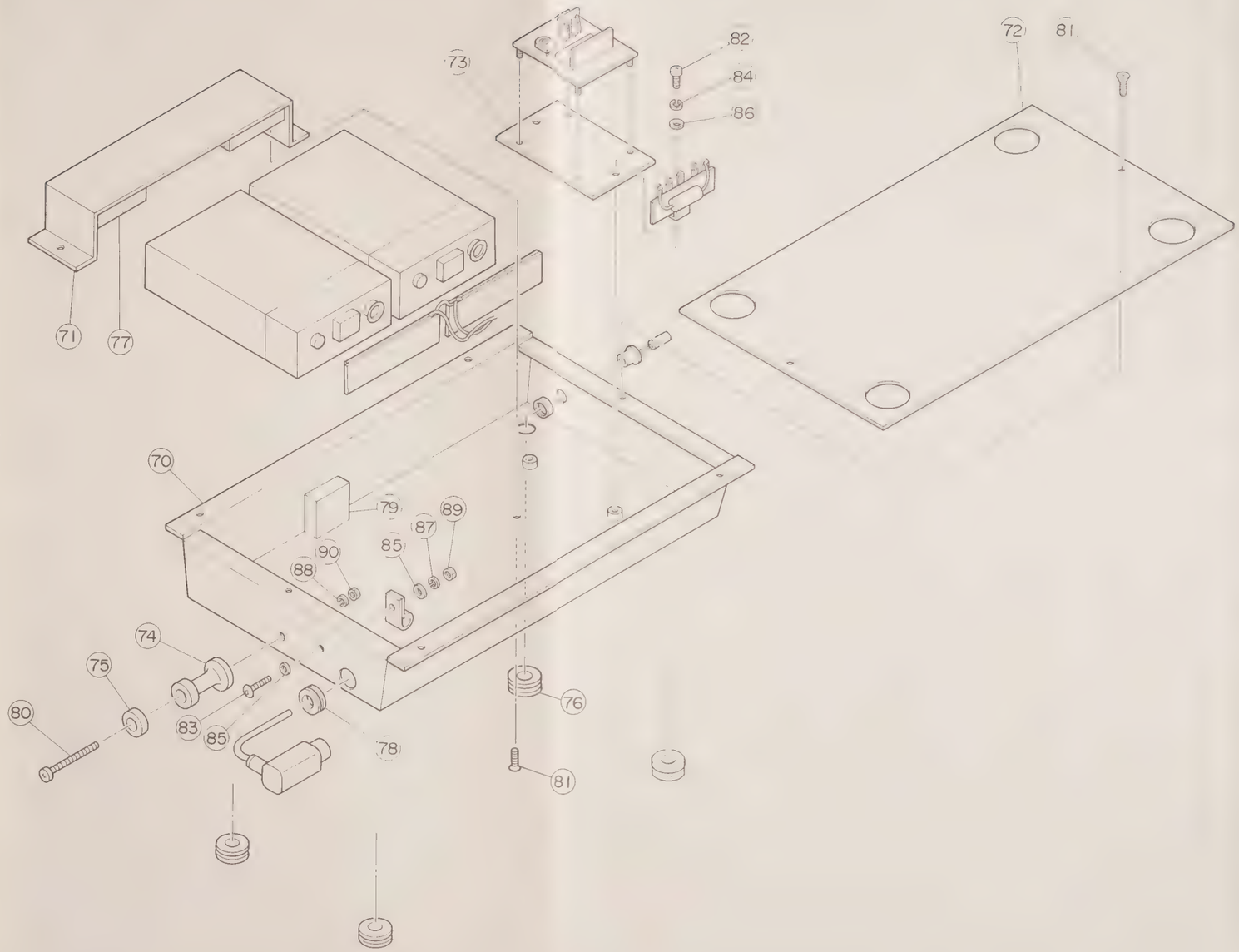
MECHANICAL REPLACEABLE PARTS LIST (V-059B)

Symbol	Description	Code	Qty	Remarks
A 1	Chassis, main	275597	1	
2	Cover	275598	1	
3	Plate	3125026	1	
4	Chassis, front	3125027	1	
5	Chassis, connector	8279810	1	
6	Chassis, Vert.-P.C.B.	8219258	1	
7	Chassis, H.V.-P.C.B.	8279817	1	
8	Chassis, H.V.-P.C.B.	8279818	1	
9	Subpanel, front	8279819	1	
10	Panel, front	8279820	1	
11	Panel, front	8279822	1	
12	Panel, side	8274177 ∿78	1	
13	Chassis	8279824	1	
14	Bracket, shoulder band	8287067	2	
15	Terminal, GND	8201530	1	
16	Terminal, GND	8201530	1	
17	CRT shield case	8201532	1	
18	Plate, shield case	8279825	2	
19	Nut	8279826	4	
20	Cover, handle	8279827	2	
21	Filter	8279828	1	
22	Foot	8114110	4	
23	Foot	8145689	4	
24	Bushing	ERR0014	1	
25	Nut	XCA0732	5	M6×0.75
26	Foot	ERR0042	4	
27	Knob, side	8201536	3	
28	Bezel	3122738	1	
29	Washer	8279839	4	
30	Washer	8279839	2	
31	Handle	8279832 ∿33	1	
32	Cover, side	8279834	1	
33	Index, handle ring	XCZ0110	2	
34	Knob	3122681	2	
35	Knob	3122681	2	
36	Screw, 90°CSK	XCA0168	2	M2,6×4
37	Screw,	XCA0700	4	M4×35
38	Screw, haxagon socket headless	XCA0167	6	M3×4
39	Screw	XCA0733	6	M2,6×6
40	Bushing	8279723	1	
41	Screw	XCA0050	4	M2 5
42	Screw	XCA0048	4	M2,6 8
43	Screw, 90°CSK	XCA0020	10	M2,6 6
44	Screw, 90°CSK	XCA0021	9	M2,6 8
45	Screw, 90°CSK	XCA0033	2	M3 6
46	Screw	XCA0058	2	M2,6 5
47	Screw	XCA0056	2	M2,6 12
48	Screw	XCA0082	14	M3 8
49	Washer	XCA0012	5	M2,6
50	Washer	XCA0013	14	M3
51	Washer, spring	XCA0106	7	M2,6
52	Washer, spring	XCA0107	14	M3
53	Washer, spring	XCA0108	4	M4
54	Nut	XCA0140	5	M2,6
55	Washer, toothed lock	XCA0010	3	M6



MECHANICAL REPLACEABLE PARTS LIST (AD-058B)

Symbol	Description	Code	Qty	Remarks
70	Case	3125029	1	
71	Chassis, batterie	8287074	1	
72	Cover	8287075	1	
73	Plate	8287076	1	
74	Foot	8114110	1	
75	Foot	8145689	1	
76	Foot	ERR0042	4	
77	Cushion	8279760	2	
78	Bushing	ERR0014	1	
79	Cushion	8274129	1	
80	Screw	XCA0700	1	M4×35
81	Screw, 90°CSK	XCA0020	4	M2,6×6
82	Screw	XCA0059	2	M2,6×6
83	Screw	XCA0068	1	M3×10
84	Washer	XCA0012	2	M2.6×6
85	Washer	XCA0106	1	M3
86	Washer, spring	XCA0106	2	M2,6
87	Washer, spring	XCA0107	1	M3
88	Washer, spring	XCA0108	1	M4
89	Nut	XCA0141	1	M3
90	Nut	XCA0142	1	M4



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